NASA LABORATORY ANALYSIS FOR MANNED EXPLORATION MISSIONS

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ABSTRACT
The Exploration Laboratory Analysis (ELA) project supports the Exploration Medical Capability Element under the NASA Human Research Program. ELA instrumentation is identified as an essential capability for future exploration missions to diagnose and treat evidence-based medical conditions. However, mission architecture limits the medical equipment, consumables, and procedures that will be available to treat medical conditions during human exploration missions. Allocated resources such as mass, power, volume, and crew time must be used efficiently to optimize the delivery of in-flight medical care. Although commercial instruments can provide the blood and urine based measurements required for exploration missions, these commercial-off-the-shelf devices are prohibitive for deployment in the space environment. The objective of the ELA project is to close the technology gap of current minimally invasive laboratory capabilities and analytical measurements in a manner that the mission architecture constraints impose on exploration missions. Besides micro gravity and radiation tolerances, other principal issues that generally fail to meet NASA requirements include excessive mass, volume, power and consumables, and nominal reagent shelf-life. Though manned exploration missions will not occur for nearly a decade, NASA has already taken strides towards meeting the development of ELA medical diagnostics by developing mission requirements and concepts of operations that are coupled with strategic investments and partnerships towards meeting these challenges. This paper focuses on the remote environment, its challenges, biomedical diagnostics requirements and candidate technologies that may lead to successful blood/urine chemistry and biomolecular measurements in future space exploration missions.

SUMMARY
The NASA Exploration Laboratory Analysis project seeks to develop capability to diagnose anticipated space exploration medical conditions on future manned missions. To achieve this goal, NASA will leverage existing point-of-care technology to provide clinical laboratory measurements in space. This approach will place the project on a path to minimize sample, reagent consumption, mass, volume and power. For successful use in the space environment, NASA specific conditions such as micro gravity and radiation, for example, will also need to be addressed.